

UNITED STATES PATENT APPLICATION

OF

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FOR

ORGANIC ELECTRO-LUMINESCENCE DISPLAY

AND MANUFACTURING METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Application No. P2003-24103, filed on April 16, 2003, which is hereby incorporated by reference as if fully set forth herein.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a display panel, and more particularly, to an organic electro-luminescence display and a manufacturing method thereof.

Discussion of the Related Art

[0003] In recent years, a variety of a magnetic type luminescence display has been developed, and a basic structure of the magnetic type luminescence display is a horizontal array of light emitting devices driving one pixel as an element. As an example of the magnetic type luminescence display, there are a VFE (Vacuum Fluorescence Display), an EL (Electro-luminescence), an LED (Light Emitting Diode), and a FED (Field Emission Display) as well as a

PDP (Plasma Display Panel) having a cell as a luminescence device, the cell divided by a discharge area.

[0004] Among the magnetic type luminescence displays, particularly, an organic EL display panel enabling to obtain a surface luminescence with high brightness at a low voltage and RGB luminescence with a high degree of purity has come to be the center of attention for a ultra slim size, a light weight, and full color.

[0005] The organic EL display forms an organic layer including an emitting layer between a couple of electrodes including an anode applied to a positive voltage and a cathode applied to a negative voltage. In the organic display, by applying voltage between electrodes, an electron from cathode and a hole from anode are injected into each organic layer, and the electrode and the hole are coupled in the organic layer thereby light is emitted. The EL display panel including the organic EL device is described in reference to appended drawings.

[0006] FIG. 1 illustrates a floor plan of a conventional organic display panel. As illustrated in the drawing, the organic display panel includes a glass substrate 101, an ITO strip 102 formed in a strip form and arrayed in a line on the glass substrate, a supplement electrode 103 formed in a smaller width than the ITO strip on the ITO strip 102, an organic EL layer 104 having a hole transport layer, the emitting layer, and an electron transport layer piled on the ITO strip 102, an insulating film 106 formed between the ITO strip 102 and a bulkhead, an anode

strip 105 crossing the ITO strip 102 on the organic EL layer 104 and formed in a band, a bulkhead 107 formed in the band form between the anode strips 105 for separating the neighboring anode strips 105, and a seal-cover 109 coupled to a substrate having the anode strip 105 by using a sealant 108.

[0007] In this case, the organic EL display panel is formed in a structure wherein the organic EL layer 104 is inserted between the ITO strip 102 having one higher work function and the anode strip 105 having one lower work function on the glass substrate 101. The ITO strip 102 having one higher work function is employed as an anode for injecting the hole and the anode strip 105 having one lower work function is employed as a cathode for injecting the electron.

[0008] FIG. 2A to FIG. 2F illustrates a perspective view showing an organic EL display panel in accordance with the related art. First, as illustrated in FIG. 2, a transparent ITO strip 102 is formed on the glass substrate 101 for applying the anode. In this case, an ITO strip 102-A having a short length is also formed between the bulkheads 107 for extracting the anode strip 105 with ease.

[0009] And then, as illustrated in FIG. 2B, the supplement electrode 103 is formed of such conductive metal as Mo and Cr. In this instance, if a width of the supplement electrode 103 is wider than the ITO strip 102 at a location where the sealant 108 and the supplement electrode

103 are crossed, the sealant 108 on the supplement electrode 103 is not hardened 경화 when the sealant 108 is hardened by using UV. Therefore, the width of the supplement electrode 103 at the location where the sealant 108 and the supplement electrode 103 are crossed is set narrower than the ITO strip 102 thereunder.

[0010] Subsequently, as illustrated in FIG 2C and FIG. 2D, the ITO strip 102 further includes the insulating film 106 for insulating the bulkhead 107 from the anode strip 105. In this case, the insulating film 106 is formed in a blended form of an organic matter, an inorganic matter, and a macromolecule.

[0011] As illustrated in FIG. 2E and FIG. 2F, an organic layer 104 is formed on top of the insulating film 106 and the bulkhead 107, and then the anode strip 105 including Mg-Ag compound metal and aluminum or other conductive matter is formed. Finally, the seal-cover 109 is adhered by using the sealant 108.

[0012] FIG. 3 illustrates a floor plan showing an organic EL display panel after the glass substrate and the seal-cover are adhered by using the sealant in accordance with the related art.

[0013] As illustrated in FIG. 3, when the glass substrate 101 and the seal-cover 109 are adhered by using the sealant 108, there is a problem that the sealant 108 is injected along the bulkhead 107 into an emitting cell. The problem is described referring to FIG. 4A and FIG. 4B.

[0014] FIG. 4A illustrates a cross-sectional view of the display panel illustrated in FIG. 3 in accordance with an A direction, and FIG. 4B illustrates a cross-sectional view of the panel illustrated in FIG. 3 in accordance with a B direction.

[0015] As illustrated in the drawings, when the sealant 108 is in contact with the bulkhead 107, the sealant 108 is injected along the bulkhead 107 into the emitting cell. Then, the sealant 108-A influences the anode strip and the organic matter, thereby resulting a problem of an inferior emitting cell.

SUMMARY OF THE INVENTION

[0016] Accordingly, the present invention is directed to an organic EL (Electroluminescence) display panel that substantially obviates one or more problems due to limitations and disadvantages of the related art.

[0017] An object of the present invention is to provide an organic EL display panel and a manufacturing method of the same for preventing a sealant from being injected along a bulkhead into an emitting cell when a glass substrate and a seal-cover is adhered by using a sealant.

[0018] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary

skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0019] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, the organic EL display panel including an emitting cell having an ITO strip, a supplement electrode, an organic EL layer, and an anode strip, and a bulkhead for insulating the emitting cell from the anode strip, being characterized in, the organic EL display panel further including at least one supplement bulkhead for coupling the bulkheads.

[0020] Desirably, the supplement bulkhead is provided in an area between the emitting cell and the sealant. Desirably, the supplement bulkhead forms a predetermined angle with the bulkhead.

[0021] In another aspect of the present invention, a method of manufacturing an organic EL display panel includes the steps of forming a supplement electrode in a smaller width than ITO strip, forming an insulating film, forming a bulkhead and at least one supplement bulkhead coupling the bulkheads, forming an organic EL layer and an anode strip, and adhering the seal-cover and the glass substrate by using a sealant.

[0022] Desirably, in the fourth step of the process, the bulkhead and the supplement bulkhead are formed at the same time.

[0023] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings;

[0025] FIG. 1 illustrates a floor plan of a conventional organic display panel.

[0026] FIG. 2A to FIG. 2F illustrates a perspective view showing an organic EL display panel in accordance with a related art.

[0027] FIG. 3 illustrates a floor plan showing an organic EL display panel after a glass substrate and a seal-cover are adhered by using a sealant in accordance with a related art.

[0028] FIG. 4A illustrates a cross-sectional view of a display panel illustrated in FIG.

[0029] FIG. 4B illustrates a cross-sectional view of a panel illustrated in FIG. 3 in accordance with a B direction.

[0030] FIG. 4 illustrates a cross-sectional view of Y direction of an organic display panel in accordance with a related art

[0031] FIG 5A to FIG. 5G illustrate a manufacturing process of an organic EL display panel in accordance with the present invention.

[0032] FIG. 6 illustrates a structure of a supplement bulkhead in accordance with the present invention.

[0033] FIG. 7A to FIG. 7B illustrate various forms of supplement bulkheads in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0034] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0035] FIG. 5A to FIG. 5G illustrate a manufacturing process of an organic EL display panel in accordance with the present invention. First, as illustrated in FIG. 5A, an ITO strip 512

is formed on a glass substrate 511 for applying an anode. In this case, an ITO strip 512-A having a short length is formed between bulkheads to be described later at the same time to make it easier to extract an anode strip to be described later.

[0036] And then, as illustrated in FIG. 5B, a supplement electrode 513 is formed in a smaller width than that of the ITO strip 512 as such a conductive metal as Mo and Cr.

[0037] As illustrated in FIG. 5c, an insulating film 516 is further formed. In this case, the insulating film 516 is provided from a predetermined area including a location where a sealant and the supplement electrode 513 are crossed to a portion of the glass substrate 511 around an organic EL display to be described later.

[0038] As illustrated in FIG. 5D, a bulkhead 517 electrically insulating is provided for insulating between the anode strips to be described later. In this case, a supplement bulkhead 517-A is further provided for preventing a sealant 518 from being injected along the bulkhead into an emitting cell.

[0039] In other words, as illustrated in FIG. 6A, the supplement bulkhead 517-A is provided at a distance of a from the emitting cell, in a length of b, and inside at a distance of c from an end of the bulkhead 517. In this case, each of the a, b, c is set larger than 0.

[0040] Meanwhile, the supplement bulkhead 517-A is formed in various types of forms. In other words, as illustrated in FIG. 7A to FIG. 7C, the supplement bulkhead 517-A is provided

at a predetermined angle (larger than 0 and less than 180), not at a right angle. In this case, the symbol θ and θ' are an angle between the bulkhead 517 and the supplement bulkhead 517-A.

[0041] As illustrate in FIG. 7D to FIG. 7E, the supplement bulkhead 517-A may be formed in many polygonal, circular, and oval forms. Similarly, as illustrated in FIG. 7F, the sealant is prevented by the bulkhead 517 including more than two supplement bulkheads 517-A.

[0042] And then, as illustrated in FIG. 5E, the organic EL layer 514 including the hole transport layer, the emitting layer, and the electric transport layer is formed, and then the anode strip 515 including Mg-Ag compound metal, Aluminum or other conductive material is formed.

[0043] Finally, as illustrated in FIG. 5F, the seal-cover 519 is adhered by using the sealant 518 so as to complete the organic EL display panel. As illustrated in the drawing, the sealant 518 being injected along the bulkhead is stopped by the supplement bulkhead 517-A.

[0044] As described above, the organic EL display panel prevents the sealant 518 from being injected along the bulkhead 517 into the emitting cell by forming the supplement bulkhead 517-A coupling the bulkheads 517 at the end of the bulkhead thereby the inferior device is reduced and the yield is improved.

[0045] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations

of this invention provided they come within the scope of the appended claims and their equivalents.